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Shear thinning behavior of a lyotropic lamellar phase

AUTHOR(S):

Ishii, Y.; Komura, S.

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Shear thinning behavior of a lyotropic lamellar phase

Dept. of Chemistry, Tokyo Metropolitan Univ., Japan Y. Ishii[1] and S. Komura

非イオン性界面活性剤 ($C_{12}E_5$) 水溶液におけるラメラ相のレオロジー測定を行い、シアシンニング現象を見い出した。ラメラ相を形成するいくつかの組成および温度を選び、ずり応力一定の条件でずり速度を測定した。得られた結果は、理論的に予測されるずり速度と応力のスケーリング則に近いものとなった。また、ある条件下でずり速度の振動が起こることを見つけた。解析の結果、ゆらぎの特徴的振動数は平均のずり速度に比例していることがわかった。

We measure the shear thinning behavior of a lamellar phase in a binary system consisting of nonionic surfactant ($C_{12}E_5$) and water. The experiment was performed under the condition of constant shear stress while the composition and the temperature are varied. The results are in good agreement with the predicted theory, and the scaling exponent seems to be universal (1). Interestingly, we also found that the measured shear rate oscillates as a function of time (Figs. 1, 2). We show that the characteristic frequency is proportional to the averaged shear rate.

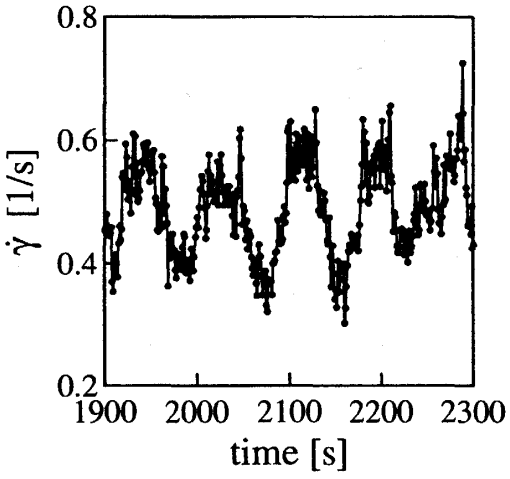

Figure 1: Time evolution of the shear rate for $\phi = 35$ wt%, $T = 339$ K and $\sigma = 0.2$ Pa.

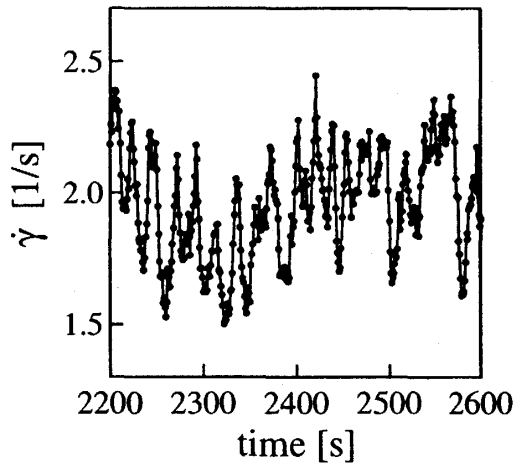

Figure 2: Time evolution of the shear rate for $\phi = 35$ wt%, $T = 339$ K and $\sigma = 0.6$ Pa.

Reference

(1) C. Meyer, S. Asnacious, and M. Kléman, Eur. Phys. J. E **6**, 245 (2001).

[1]E-mail: ishii-yoko@ed.tmu.ac.jp